

# MADE TO MEASURE MAINTENANCE STRATEGIES

**VIBRATION MONITORING** VIBRATION MONITORING AND ANALYSIS PLAYS AN IMPORTANT ROLE IN ANY CONDITION-BASED PREDICTIVE MAINTENANCE STRATEGY, SO SPECIFYING THE CORRECT SENSOR FOR THE APPLICATION IS CRUCIAL. HERE, ANDY ANTHONY, OPERATIONS DIRECTOR WITH MONITRAN, PROVIDES GUIDANCE ON VIBRATION SENSOR SELECTION

Over the past year, much has been written about the benefits of creating condition-based predictive maintenance strategies around the intelligence garnered from and through vibration monitoring and analysis: and this was in fact the theme of a presentation Monitran gave at the recent MAINTEC 2008 exhibition.

Fundamentally, your condition-based monitoring, and the analysis of any vibration levels, will only be as good as the sensor (i.e. its output characteristics, build quality and so on) and the choice of how and where you install or use it.

## A GOOD MATCH

Vibration sensors must be matched to the application otherwise they may provide misleading information, may not last long in their intended application or could even contravene industry regulations for use in hazardous areas. But with so many sensors available, from different manufacturers, where does one start?

There are essentially two types of vibration sensor: those with AC outputs and those with DC. The former are best suited to analysis, as the AC output can be put through an FFT analyser to yield information on the amplitude and structure of the vibration. The latter are best suited to 'machine protection' as they produce an output proportional to velocity or

acceleration, in the range 4-20mA, so are suitable for interfacing with monitoring and shut-down circuitry.

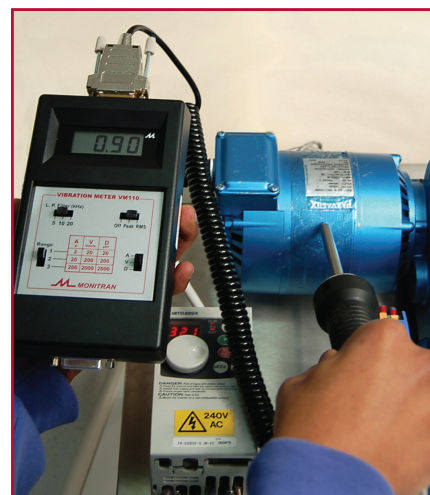
## TEMPORARY OR PERMANENT

The nature of the installation, whether it be permanent or temporary, will influence your mounting and wiring decisions and guide you towards either connectors or integral cables. If the installation is to be temporary, employing magnetic mounts, consider using ID tags on the sensors and marking clearly on each machine where the corresponding sensor should be positioned.

The most important consideration is the operating environment, which includes temperature, water, humidity and hazardous atmospheres. These considerations will steer you towards different sensor characteristics such as intrinsically safe (ATEX, IECEx...), sealing (IP67, 68...) and operating temperatures.

## SPACE ISSUES

Also, the environment, and specifically the space available for the sensor and its cable, will govern whether the sensor's cable joins the body at the top or side. Space may also influence the decision whether to use integral cable versus connector. The above considerations will certainly help you narrow down your choice of sensor and, for most seemingly 'novel' applications, you will probably be surprised how many



Monitran's vibration meter can help you find the vibration hotspots on your machinery

standard products fit the bill. If not, then most manufacturers offer 'special purpose' sensors.

These special purpose sensors may, for example, be able to operate at higher temperatures, up to a few hundred degrees Centigrade, or provide higher sensitivity than normal. Other options available include charge output accelerometers, dual output devices for combined analysis and monitoring, devices which measure acceleration and temperature, tri-axial sensors and seismic accelerometers.

## PROTECTING EQUIPMENT

Have no doubt, vibration sensors certainly need to be fit-for-purpose, as they are often used to protect equipment worth thousands, or even hundreds of thousands of pounds. In addition, a well-planned predictive maintenance regime, which includes the use of vibration monitoring and analysis, will also reduce the need for unscheduled plant shutdown and the risk of personal injury to staff.

Further, when standard and even 'special purpose' sensors don't seem to quite fit the bill it is worth remembering that a number of sensor OEMs offer a full custom design service.

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## ENSURING YOUR SENSOR IS 'FIT FOR PURPOSE'

An essential part of the fit-for-purpose argument is making the most of a vibration sensor's output. For example, the MTN/1100 operates across the range  $\pm 80g$  and is available with a standard sensitivity of 100mV/g - with optional sensitivities of 10, 30, 50, 500mV/g and 1V/g also available. If exposed to its full operating range of  $\pm 80g$ , a standard sensor will output -8 to 8V. Within this range a change in acceleration of 1g would correspond to a change of 100mV. However, if the sensor is likely to be exposed to only  $\pm 8g$ , then it would be wiser to select a sensor with a sensitivity of 1V/g, as a change of 1g would then correspond to a change of 1V.

In other words, it is the old argument of range versus sensitivity. Another electrical consideration is the frequency response. The MTN/1100's response starts at 0.8Hz but if you need to measure movement in a large structure such as a bridge, then you may need to use a dedicated low frequency sensor such as the MTN/7100 which measures down to DC (0Hz). Advice: If in doubt, measure first! There are a number of portable handheld vibration meters on the market. Using one will enable you to find the vibration hotspots on your machinery and then correctly spec the sensors to give you the optimum outputs.

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